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EXAMINER

JUBA JR, JOHN

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 10/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/663,964

Applicant(s)

BABBITT ET AL.

Examiner

John Juba

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-- Th MAILING DATE of this communication appears on the cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-42, 44, and 52-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 44 is/are allowed.
- 6) ☒ Claim(s) 27-42 and 52-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 27, 28, 30 – 34, 36 - 39, 42, and 52 – 55 are rejected under 35 U.S.C. 102(b) as being anticipated by Weiner, et al (*IEEE J. Quantum Elec.*). [italicized passages stand substantially as set forth in the last Office action.] Before turning to the elements of the claim, basic operation of the spectral hologram will be discussed in connection with Figure 1, wherein *Weiner, et al* disclose

an active material ("thermoplastic plate"); and

an ordered assemblage of subgratings supported by the active material for receiving input pulses along an input path (e.g., "signal beam" in Fig. 1a) and transmitting output pulses along an output path (e.g., "reconstructed beam" in Fig. 1b).

A portion of the "assemblage" is illustrated in the "expanded view" of Figure 1a. Weiner, et al discloses (Pg. 2252, lines 7-11) that each spectral component of the pulse in the first beam is stored as a series of fringes (i.e., a "subgrating") due to interference with the corresponding spectral component of the pulse in the second beam. It will be appreciated that, since the plurality of spectral components are angularly dispersed by the grating (leftmost in the figure) to be spatially distributed across the surface of the

"active medium" in an orderly fashion, the "assemblage", is an "ordered assemblage" of subgratings, wherein each subgrating corresponds to one of the spatially spread spectral components. At the bottom of the first column of text on Page 2252, Weiner, et al explain how an output pulse is derived from the assemblage of gratings. The respective spectral components diffract from corresponding subgratings, in proportion to their original weighting. At the bottom of the first column of text on Page 2253, Weiner, et al explain how the role of "reference" and "signal" beams can be interchanged. This result is not unexpected, given the analogy expressly drawn between the disclosed method and "traditional spatial-domain Fourier-transform holography" (last five lines on Pg. 2251). Further, Weiner, et al disclose that both the "reference" pulse and "signal pulse" can be spectrally encoded (Pg. 2252, first column, lines 13-17). One of ordinary skill would recognize this as being analogous to spatially-encoding a "reference" beam used when storing data spatially encoded in an "object" beam. Under such circumstances, it will be appreciated that the corresponding data can only be retrieved with a playback beam that is spatially encoded in the same way as the original reference beam. Accordingly, the results reported in connection with Figure 6 (Section III at "C.") should not be unexpected. Weiner, et al disclose a composite grating comprising a frequency non-selective "active" material (thermoplastic) and an ordered assemblage ("fringe pattern") of subgratings supported thereby for receiving input pulses and transmitting output pulses, each subgrating satisfying a grating condition to diffract light from an input path to an output path. Referring to section III at "C 1)",

a first input optical pulse having a first, phase encoded temporal waveform produces an output waveform (Fig. 6b) having a prescribed output temporal waveform, whereas a second input pulse, not having the prescribed input temporal waveform does not produce an output pulse having the prescribed temporal waveform, but rather, produces a pseudorandom noise burst (e.g., Fig. 6d).

→Turning then to the elements of amended claim 27 in relation to the matched filters of the prior art (§ III.C), and referring to the particular case of “angular multiplexing” of matched filters (atop Pg. 2257), Weiner, et al disclose

(a) an active material (“thermoplastic plate”); and

(b) an ordered assemblage of subgratings supported by the active material for receiving input pulses along an input path (*i.e.*, that of the “incoming waveform”) and transmitting output pulses along a output paths (*i.e.*, the “different diffracted direction” of each correlated output), wherein

(1) each subgrating satisfies a grating condition so as to diffract a respective subbandwidth of light from the input path to one of the output paths, since each matched filter is a subset of subgratings (from the total assemblage) corresponding to a subbandwidth of spectral components uniquely weighted for each matched filter, and each subgrating diffracts light of a corresponding spectral component to the output direction angularly encoded for that matched filter, and

(2) the [total assemblage of] subgratings are configured such that (i) a first input optical pulse having a first temporal waveform substantially similar to ("correlated with") one of a plurality of address temporal waveforms (matched filters) encoded in the subgratings each corresponding to one of the output paths (a diffracted output direction), produces an output pulse of prescribed temporal waveform to [at least] one of the output paths, and (ii) a second input optical pulse, different from (not correlated with) any of the plurality of address temporal waveforms (matched filters) does not produce an output optical pulse having the prescribed output temporal waveform and propagating along one of the output paths [but rather, produces a noise burst].

The examiner regards the matched filters of Weiner, et al as fairly constituting "address temporal waveforms encoded in the subgratings" since only the appropriately encoded playback pulse retrieves the desired result. Although Weiner, et al discuss simultaneously correlating a single input with a *plurality* of matched filters simultaneously, and although it is understood that a plurality of outputs will obtain where there is correlation with a plurality of filters, the subgratings nonetheless produce the prescribed output pulse along at least one of the output paths when the input pulse is substantially similar to at least one of the stored waveforms. Notwithstanding the fact that the claim does not recite output to a "single" one output path, or to a "unique" one output path, Weiner, et al clearly teach storing "different waveforms". One of ordinary skill would recognize this as the disclosure of a structure, that produces no useful output

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where there is no correlation, and that produces a single output where there is correlation with a single matched filter.

With regard to claim 28, a portion of the input pulse ("test beam") passes through the grating assemblage, undiffracted (as shown in the basic setup of Fig. 1b). Thus, irrespective of their angular trajectory, to the extent that the input pulse and output pulse ("reconstructed pulse") are of finite spatial extent within the volume of the active material, and the two pulses *inherently* overlap at least partially.

The elements of independent claims 37 and 55 are similarly recited and read on the elements of the prior art in the manner set forth above.

With regard to claims 37, et seq., a detected output waveform is plotted in each of Figures 6a – 6d. Thus, the apparatus of Weiner, et al had to include a detector "capable of detecting an optical pulse having a prescribed detectable temporal waveform (impulse) different from each of the set of specific [input] temporal waveforms". Differently encoded waveforms are multiplexed using differently encoded input pulses (See Section III, at C 2 on Pg. 2257; "Storage . . .). Clearly "retrieval" of the original waveform, or verification of such requires a detector capable of detecting the encoded waveform. The characterization of the coding as "address" encoding is not recognized as positively limiting the structure. The content of the message is not germane to the structure for encoding and/or storing the message. Further, since only the appropriately encoded playback pulse retrieves the desired result, the information encoded therein may fairly be regarded as an "address".

→Claim 37 and its dependent claims further require the “prescribed detectable temporal waveform” to be different than the “prescribed input temporal waveform”. Each of matched filters of Weiner, et al is a collection of subgratings formed by the coherent interference of a “reference” pulse (“reference beam”) and a spectrally encoded “object” pulse (“signal beam”, as shown in the basic recording geometry of Fig. 1a). It should be readily apparent that Weiner, et al disclose a reference pulse waveform that is different from the signal pulse waveform. In the angularly multiplexed matched filtering setup, light diffracted into any particular diffracted direction is indicative of the correlation between the input temporal waveform and the address temporal waveform (matched filter) recorded in a geometry corresponding to the particular direction. Depending upon the playback geometry, an input temporal waveform substantially similar to the address temporal encoded waveform will give rise to a “prescribed detectable temporal waveform” having the shape of *the reference pulse* or a conjugate thereof (see discussion of equations 1 and 2).

With regard to claims 34, 38, 39, and 52 - 54, Weiner, et al disclose a preferred embodiment that employs a “thin holographic medium” (Pg. 2252, bottom of second column) in which Bragg angle selection is not required. Both amplitude and phase of the interfering beams is recorded (bottom of first column, Pg. 2252). Thus, it will be appreciated that the preferred embodiment is one in which a surficial grating condition must be satisfied. However, one of ordinary skill would recognize the reference to “angular multiplexing” atop Page 2257 as a clear reference to Bragg angle selection in the hologram of a non-preferred embodiment.

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→In both cases, each respective subgrating corresponds to a single matched filter, recorded in a single angular geometry, and satisfies the grating condition for a single diffracted direction corresponding to the single angular recording geometry.

With regard to claims 36 and 42, Weiner, et al employ a frequency non-selective recording medium, as described on Page 2251, second column, second paragraph.

With further regard to claim 43, the data source was similar to that of Figure 1, but incorporated a set of phase masks for data encoding.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 29, 35, 40, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Weiner, et al (*IEEE J. Quantum Elec.*). [The rejection stands as set forth in the last Office action (paper # 18), and is repeated here only for convenience.]

As set forth above for claims 27, 28, and 37, Weiner, et al disclose the invention substantially as claimed. However, Weiner, et al do not disclose an actual embodiment in which the output pulse travels in a direction opposite to the direction of the input pulse, or subgratings which comprise index variations. Nonetheless, Weiner, et al

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disclose such prophetic embodiments in the paragraph immediately preceding their "Acknowledgement " on Page 2260. That is, one of ordinary skill will recognize the suggestion to use "photorefractives" as a suggestion to modify the active medium to be one in which the subgratings comprise refractive index variations. Thus, it would have been obvious to provide the subgratings with refractive index variations, in the interest of permitting the subgrating assemblage to be adaptively reconfigures, as expressly suggested by Weiner, et al. Similarly, one of ordinary skill will appreciate that "feedback of from the output beams back to the input" would involve the output pulse traveling in a direction opposite to the input pulse. Thus, it would have been obvious to one of ordinary skill to have the output pulse traveling in the direction opposite to the input pulse, in the interest of permitting associative recall of pulse waveforms, as expressly suggested by Weiner, et al.

Allowable Subject Matter

Claim 44 is allowable over the prior art. The following is a statement of reasons for the indication of allowable subject matter:

The prior art, taken alone or in combination, fails to teach or to fairly suggest the composite grating *in combination* with a router responsive to change the routing of data in response to an optical pulse having the prescribed detectable temporal waveform along the output path *from the composite grating*, as recited in claim 44.

Response to Amendment

Applicants' remarks concerning the rejection of claim 44 are persuasive in the following regard, and the rejection of claim 44 under 35 U.S.C. §102(b) as being anticipated by Weiner, et al (*IEEE J. Quantum Elec.*) is *withdrawn*. Applicants are correct in noting that the system of Weiner, et al lacks the cooperation of elements recited in claim 44. The examiner previously misconstrued the composite grating recited in claim 44 *to be* the router, rather than being *combined* with a waveform responsive router. Clearly, the "routing system" of claim 44 requires both elements "(a)" and "(b)". As described atop Page 48 of the instant specification, one exemplary embodiment may in fact have *two* composite gratings: one acting as a lookup table to produce the prescribed temporal output waveform, "(b)"; the other routing the pulse based upon the temporal waveform, "(a)".

Applicants are further correct in noting that the expression "angularly multiplexed holograms" does not appear in the text atop Page 2257 of the reference. Rather, the examiner expected that Applicants would recognize that the discussion of "angular multiplexing" in the context of hologram recording is a discussion of angularly multiplexed holograms. The examiner apologizes for the confusion. Nonetheless, the point remains that, in the discussion atop Page 2257, Weiner, et al clearly disclose angular multiplexing multiple matched filters stored in the hologram whereby an incoming waveform matching a stored waveform would be directed to a particular output path ("diffracted direction") or to several output paths, where there is correlation of the

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input pulse with several stored pulses. In this respect, the composite grating of Weiner, et al acts the same way as a waveform sensitive router.

Since Weiner, et al clearly disclose operation in the aforesaid manner, Applicants' amendment of claims 27 and 37 fails to distinguish over the prior art. Thus, for the reasons particularly set forth in the rejection above, claims 27, 28, 30 – 34, 36 – 39, 42, and 52 – 54 continue to be rejected under 35 U.S.C. 102(b) as being anticipated by Weiner, et al (*IEEE J. Quantum Elec.*). Claim 55 is newly rejected on these same grounds. The cancellation of claim 43 obviates its continued rejection on these grounds.

Applicants' remarks concerning the rejection of claims 29, 35, 40, and 41 under 35 U.S.C. 103(a) as being unpatentable over by Weiner, et al (*IEEE J. Quantum Elec.*) have been fully considered, but are not found persuasive. Applicants' correctly note that all of the language of the claims must be considered in determining patentability. The examiner believes that each material limitation of the claims has been addressed. Applicants have not identified any claim language that was being overlooked. Since the base reference is not considered to be deficient in the manner relied upon in Applicants' rebuttal, and since each additional limitation has been addressed in the rejection, the rejection stands as set forth in the last Office action (paper #18).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Paek, et al disclose a holographic code division multiple access router comprising an ordered assemblage of subgratings (matched filters) corresponding to *spatially*-encoded input beams.

Brackett, et al disclose a system for optical routing based upon spectrally encoded short pulses.

J.A. Salehi and E.G. Paek (*IEEE Trans. on Comm.*) disclose a holographic CDMA system based upon *spatially*-encoded input beams and identify a particular advantage as being the independence of the system with respect to input (temporal) modulation format – a feature not shared with other all-optical CDMA systems.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn can be reached on Mon.- Thu., 9 - 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

October 8, 2003